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Simulation of $Z(3)$ walls and string production via bubble nucleation in a quark-hadron transition

Content :

We study the dynamics of confinement-deconfinement (C-D) phase transition in the context of relativistic heavy-ion collisions within the framework of effective models for the Polyakov loop order parameter. We study the formation of $Z(3)$ walls and associated strings in the initial transition from the confining (hadronic) phase to the deconfining (QGP) phase via the so called Kibble mechanism. Essential physics of the Kibble mechanism is contained in a sort of domain structure arising after any phase transition which represents random variation of the order parameter at distances beyond the typical correlation length. We implement this domain structure by using the Polyakov loop effective model with a first order phase transition and confine ourselves with temperature/time ranges so that the first order C-D transition proceeds via bubble nucleation, leading to a well defined domain structure. The formation of $Z(3)$ walls and associated strings results from the coalescence of QGP bubbles expanding in the confining background. We investigate the evolution of the $Z(3)$ wall and string network. We also calculate the energy density fluctuations associated with $Z(3)$ wall network and strings which decay away after the temperature drops below the quark-hadron transition temperature during the expansion of QGP. We discuss evolution of these quantities with changing temperature via Bjorken's hydrodynamical model and discuss possible experimental signatures resulting from the presence of $Z(3)$ wall network and associated strings.

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